IN THE CLAIMS

Claims 186 – 217 are in this application.

Claims 186 -189, 194-198, 200-202, 214, 216and 217 are currently amended herein.

186. (Currently amended) A complete, forced-circulation, liquid cooling system for cooling heat-generating components in an electronic system comprising:

~~a heat exchange unit for receiving heated coolant and generating cooled coolant;~~

one or more heat transfer units coupled to ~~the~~ one or more heat-generating components for receiving cooled liquid coolant ~~from the heat exchange unit~~ and generating heated liquid coolant by transfer of heat from the heat-generating components to the liquid coolant; ~~for transportation to the heat exchange unit; and~~

a heat exchange unit, remotely disposed from the heat transfer units and the heat-generating components, for receiving heated liquid coolant from the heat transfer units and generating cooled coolant for transportation to the heat transfer units;

a forced circulation ~~transportation~~ means, remotely disposed from the heat transfer units and the heat-generating components, for forcing transporti~~n~~gon, at accelerated rates, of cooled liquid coolant from the heat exchange unit to the heat transfer units and ~~for transporting~~ of heated liquid coolant from the heat transfer units to the heat exchange unit; ~~and~~

a liquid coolant pathway for delivery of the cooled liquid coolant from the heat exchange unit to the heat transfer units and for delivery of the heated liquid coolant from the heat transfer units to the heat exchange unit; and

wherein the complete liquid cooling system has no component acting as a liquid coolant reservoir while the liquid cooling system is in operation.

187. (Currently amended) The cooling system of claim 186 wherein one or more heat transfer units have an inlet for receiving cooled liquid coolant from the heat exchange unit and an outlet for receiving heated liquid coolant for transporting to the heat exchange unit, wherein the inlet is disposed below the outlet for enhancing convective circulation of the liquid coolant.

188. (Currently amended) The cooling system of claim 186 wherein the heat exchange unit has an inlet for receiving heated liquid coolant from the heat transfer units and an outlet for ~~receiving~~ cooled liquid coolant ~~from the heat exchange unit~~ for transportingon to the heat transfer units, wherein the outlet is disposed below the inlet for enhancing convective circulation of the liquid coolant.

189. (Currently amended) The cooling system as set forth in claim 186 wherein one or more heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of one or more heat-generating components and forming cavities there with and wherein the liquid coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component.

190. (Previously submitted) A data processing system having the cooling system of claim 186.

191. (Previously submitted) A telecommunications system having the cooling system of claim 186.

192. (Previously submitted) An optical device having the cooling system of claim 186.

193. (Previously submitted) A system having one or more processors and having the cooling system of claim 186.

194. (Currently amended) A method of cooling heat-generating components in an electronic system having a complete liquid cooling system and a means for forced circulation of a liquid coolant ~~transportation means for transporting coolant~~ at accelerated rates remotely located from the heat-

generating components and having a transportation means for transporting the liquid coolant, the method comprising the steps of:

~~receiving heated coolant from one or more heat transfer units at a heat exchange unit;~~

~~cooling the coolant within the heat exchange unit for transportation to the heat transfer units;~~

~~receiving cooled coolant from the heat exchange unit, at the heat transfer units;~~

heating ~~the~~ liquid coolant within ~~the~~ one or more heat transfer units coupled to one or more heat-generating components by transferring heat from the heat-generating components to the liquid coolant thereby creating heated liquid coolant for transportation by forced circulation to ~~the~~ a heat exchange unit remotely disposed from the heat transfer units and the heat-generating components; ~~and~~

receiving the heated liquid coolant from the heat transfer units at the heat exchange unit;

cooling the heated liquid coolant within the heat exchange unit, thereby creating cooled liquid coolant, for transportation to the heat transfer units;

receiving cooled coolant from the heat exchange unit at the heat transfer units; and

wherein all of the above steps are performed in the complete liquid cooling system having no component acting as a reservoir for the liquid coolant while the liquid cooling system is in operation.

195. (Currently amended ) The method of claim 194 wherein one or more heat transfer units have an inlet for receiving cooled liquid coolant from the heat exchange unit and an outlet ~~for receiving heated coolant~~ for transporting heated liquid coolant to the heat exchange unit, the method further comprising the step of:

positioning the inlet below the outlet, for enhancing convective circulation of the liquid coolant.

196. (Currently amended) The method of claim 194 wherein the heat exchange unit has an inlet for receiving heated liquid coolant from the heat transfer units and an outlet for transporting cooled liquid coolant to the heat transfer units, the method further comprising the step of:

positioning the inlet above the outlet, for enhancing convective circulation of the liquid coolant.

197. (Currently amended) The method of claim 194 wherein one or more heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of one or more heat-generating components and forming cavities there with and wherein the liquid coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component, the method further comprising the step of:

removing heat from one or more heat-generating components into the liquid coolant by direct contact of the coolant with the heat-generating components.

198. (Currently amended) A cooling system for cooling heat-generating components in an electronic system, the cooling system having one or more heat transfer units thermally coupled to one or more heat-generating components, forced circulation means for forcing circulation of a coolant through the cooling system; coolant pathways for transporting the coolant through the cooling system, a heat exchange unit and no component in the cooling system acting as a reservoir while the cooling system is in operation, the heat exchange unit comprising:

an input cavity for receiving heated coolant from the heat transfer units and distributing the heated coolant;

a dissipater for receiving the distributed heated coolant from the input cavity and cooling the coolant;

an output cavity for receiving the cooled coolant from the dissipater and directing the cooled coolant to the heat transfer units ~~cooling system~~; and

wherein the cooling system, including the heat exchange unit, has no component acting as a reservoir while the cooling system is in operation.

199. (Previously submitted) The cooling system as set forth in claim 198 wherein the input cavity is disposed above the output cavity for enhancing convective circulation of the coolant.

200. (Currently amended) The cooling system as set forth in claim 198 wherein the force circulation means is a pump is disposed in the heat exchange unit.

201. (Currently amended) The cooling system as set forth in claim 200 wherein ~~a~~ the pump is a self-priming pump.

202. (Currently amended) The cooling system as set forth in claim 200 wherein ~~a~~ the pump is disposed in the output cavity.

203. (Previously submitted) The cooling system as set forth in claim 202 wherein the pump includes an impeller disposed horizontally at the very bottom of the output cavity.

204. (Previously submitted) The cooling system as set forth in claim 200 wherein the pump includes an impeller disposed horizontally at the very bottom of the heat exchange unit.

205. (Previously submitted) The cooling system as set forth in claim 203 wherein the impeller includes one or more blades with slanted surfaces inverted so as to improve the flow of coolant out of the heat exchange unit at the bottom there of.

206. (Previously submitted) The cooling system as set forth in claim 200 wherein the pump includes an impeller, the heat exchanger further comprising:

a motor; and

a shaft coupled to the motor and to the impeller for operating the pump.

207. (Previously submitted) The cooling system as set forth in claim 206 wherein no seal is required for the pump.

208. (Previously submitted) The cooling system as set forth in claim 198 wherein the dissipater further comprises a plurality of coolant pathways for transporting the heated coolant through the dissipater.

209. (Previously submitted) The cooling system as set forth in claim 208 wherein one or more of the coolant pathways includes means for creating non-laminar flow of the coolant for enhancing the transfer of heat from the coolant to the dissipater.

210. (Previously submitted) A data processing system having the cooling system of claim 198.

211. (Previously submitted) A telecommunications system having the cooling system of claim 198.

212. (Previously submitted) An optical device having the cooling system of claim 198.

213. (Previously submitted) A system having one or more processors and having the cooling system of claim 198.

214. (Currently amended) A method of cooling heat-generating components in an electronic system ~~and~~ having a cooling system, the cooling system having one or more heat transfer units thermally coupled to one or more heat-generating components, forced circulation means for forcing circulation of

a coolant through the cooling system; coolant pathways for transporting the coolant through the cooling system, a heat exchange unit, and no component in the cooling system acting as a reservoir while the cooling system is in operation, the method comprising the steps of:

receiving heated coolant from the heat transfer units at an input cavity of the heat exchange unit and distributing the heated coolant to a dissipater;

cooling the coolant in the dissipater;

receiving the cooled coolant from the dissipater at an output cavity for directing the cooled coolant to the heat transfer units ~~cooling system~~; and

wherein all of the above steps are performed in the cooling system, including the heat exchange unit, having no component acting reservoir while the cooling system is in operation.

215. (Previously submitted) The method of claim 214 further comprising the step of:

positioning input cavity above output cavity for enhancing convective circulation of the coolant.

216. (Currently amended) The method of claim 214 wherein ~~one or more heat transfer units for cooling the heat-generating components is included and~~ at least one of the heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of the heat-generating components and forming cavities there with and wherein the coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component, the method further comprising the step of:

removing heat from one or more heat-generating components into the coolant by direct contact of the coolant with the heat-generating components.

217. (Currently amended) The method of claim 214 wherein ~~the cooling system further comprises one or more heat transfer units, each heat transfer unit thermally coupled to one or more heat-generating components, the heat transfer unit receiving cooled coolant from the heat exchange unit, and removing heat from the heat-generating components by transferring heat to the coolant and creating heated coolant for transporting to the heat exchange unit, and wherein~~ one or more of the heat transfer units further comprises an inlet for receiving cooled coolant from the heat exchange unit and an outlet for receiving heated coolant for transfer to the heat exchange unit, the method further comprising the step of:

positioning the inlet below the outlet, for enhancing convective circulation of the coolant.